The use of gas discharge Penning ion sources in inertial electrostatic confinement systems

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The report presents the results of studies of the performance characteristics of gas-discharge Penning ion sources (IS) when they are used to inject ions into inertial electrostatic confinement (IEC) systems. The work carried out earlier by various authors has shown the expediency of using discrete IS in IEC systems, for example [1, 2]. IEC systems of linear, cylindrical or spherical geometries are also used for various operating conditions [3]. In this report, the use of Penning IS in case of linear and spherical geometry of a neutron emitting IEC system based on nuclear fusion reactions of hydrogen isotopes is considered. The current characteristics, power modes of the submilliampere and milliampere IS are considered, and the operation of neutron emitters based on them is compared.

[1] Michalak M K, Egle B, Kulcinski G L and Santarius J F 2011 *13th US-Japan IEC Workshop*

[2] Seltzman A 2008 *Design of an actively cooled grid system to improve efficiency in IEC fusion reactors* (Georgia institute of technology)

[3] Miley G H and Murali S K 2014 *Inertial Electrostatic Confinement (IEC) Fusion Fundamentals and Applications* (Springer)